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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 09/550,649 | 04/17/2000 | Jarod Guertin | CNA-029 | 1375 |

2292 7590 03/14/2005

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|---|---|
| KIM, DAVID S | |
| **ART UNIT** | **PAPER NUMBER** |
| 2633 | |

DATE MAILED: 03/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) |
|---|---|---|
| | 09/550,649 | GUERTIN ET AL. |
| | Examiner | Art Unit |
| | David S. Kim | 2633 |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *01 September 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 September 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

## DETAILED ACTION

### *Drawings*

1. Applicant's compliance with the objections raised in the previous correspondence (mailed on 06 August 2004) is noted and appreciated. A replacement sheet and an annotated sheet showing changes were received on 01 September 2004. Fig. 2 is still disapproved.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because:

- reference characters "120" and "225" have both been used to designate transmitter units in Fig. 2 (the specification uses "225" to refer to a transmitter diagnostic output signal, p. 10) and

- reference characters "130" and "235" have both been used to designate receiver units in Fig. 2 (the specification uses "235" to refer to a receiver diagnostic output signal, p. 10).

Examiner regrets not identifying these discrepancies in a previous action and requests Applicant's understanding of these objections in pursuit of a more accurate disclosure of Applicant's invention to the public.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

2. The disclosure is objected to because of the following informalities:

On p. 9, l. 9, "the cascaded system will carrying the errors" is used where -- the cascaded system will be carrying the errors -- may be intended.

On p. 11, l. 4, "receiver diagnostic output signals 235 form" is used where -- receiver diagnostic output signals 235 from -- may be intended.

Appropriate correction is required.

### *Claim Objections*

3. Applicant's compliance with the objections raised in a previous correspondence (mailed on 06 August 2004) is noted and appreciated. Accordingly, the objections to claims 1, 13, and 18 are withdrawn. However, **claims 21-22** are objected to because of the following informalities:

In claims 21 and 22, "cascaded" is used where -- cascade -- may be intended.

### *Claim Rejections - 35 USC § 103*

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

**Waschka, Jr. as primary reference:**

6. **Claims 1-2, 12-14, and 20** are rejected under 35 U.S.C. 103(a) as being unpatentable over Waschka, Jr. (U.S. Patent No. 4,449,247) and Maione et al. (U.S. Patent No. 4,019,048, hereinafter "Maione").

**Regarding claim 1**, Waschka, Jr. and Maione discloses:

A method (Waschka, Jr., col. 15, line 64- col. 19, line 59) of testing a bit error rate for each of a plurality (*N*) of (Waschka, Jr., channel links between stations) optical communication channels, *N* being greater than 2, having *N* (Waschka, Jr., col. 1, l. 20-30, col. 16, l. 14-26 refer to Maione, see o/e/o regeneration in Fig. 1) optical transmitters communicating to *N* optical receivers (Waschka, Jr., col. 1, l. 20-30, col. 16, l. 14-26 refer to Maione, see o/e/o regeneration in Fig. 1) via *N* communication channels, the method comprising:

cascading (Waschka, Jr., cascaded channel links in Fig. 1, col. 19, lines 25-28) said *N* optical communication channels such that an electrical (Waschka, Jr., col. 1, l. 20-30, col. 16, l. 14-26 refer to Maione, see o/e/o regeneration in Fig. 1) output of an optical receiver *i* for an optical communication channel *i* is connected to an input of an optical transmitter *i+1* for an optical communication channel *i+1*, for all values of *i* from one to *N-1*, so as to form a continuous cascade of optical transmitter/receiver pairs (Waschka, Jr., col. 19, lines 25-30);

supplying (Waschka, Jr., sequence from sequence generators 173 or 174 in Fig. 8, col. 18, lines 51-56) a bit error rate test signal from a bit error rate tester (Waschka, Jr., bit error rate test unit 22 in Fig. 8) to an input for a first optical transmitter for a first optical communication channel;

supplying (Waschka, Jr., col. 19, lines 3-12) the bit error rate test signal from an output of optical receiver *N* to the bit error rate tester;

detecting (Waschka, Jr., col. 17, lines 14-38, col. 19, lines 3-31) errors in the bit error rate test signal received by the bit error rate tester and calculating therefrom a measured system bit error rate (Waschka, Jr., col. 19, lines 3-31); and

comparing (Waschka, Jr., col. 31, lines 3-4) the measured system bit error rate with a predetermined system bit error rate threshold;

monitoring (Waschka, Jr., col. 19, lines 30-59, col. 31, lines 5-21) a signal quality for the bit error rate test signal at (Waschka, Jr., note sequence detectors 57 and 61 in Figs. 4 and 7, col. 9, lines 42-50, col. 17, lines 14-38) each of the *N* optical transmitters and each of the *N* optical receivers when the measured system bit error rate is greater than the predetermined system bit error rate threshold to thereby determine which of the *N* optical communication channels has an associated bit error rate value that is greater/less than a specified bit error rate value.

Although Waschka, Jr. and Maione do not expressly disclose that the communication system is a wavelength division multiplexed (WDM) optical communication system, Waschka, Jr. and Maione do disclose a multiplexed system (Waschka, Jr., multiplexers 155 and 156 in Fig. 7). Additionally, WDM systems are extremely well known in the art and it would have been obvious to a person of ordinary skill in the art to implement WDM system techniques in the system of Waschka, Jr. and Maione. One of ordinary skill in the art would have been motivated to do so in order to conserve fiber. That is, the system of Waschka, Jr. and Maione uses separate fiber links (Waschka, Jr., fiber optic links 17A and 17B in Fig. 1) for bi-directional communications. Using WDM techniques to send the bi-directional communications over a single fiber link would enable one to reduce the required amount of fiber by half.

**Regarding claim 2**, Waschka, Jr. and Maione disclose:

The method of claim 1 (see treatment of claim 1 under Waschka, Jr. and Maione), wherein said predetermined system bit error rate is equal to the specified bit error rate for each of N optical communication channels (see treatment of claim 1 under Waschka, Jr. and Maione).

**Regarding claim 12**, Waschka, Jr. and Maione disclose:

The method of claim 1, wherein said monitoring monitors a received signal quality (Waschka, Jr., col. 19, lines 30-59, col. 31, lines 5-21) for the bit error rate test signal (Waschka, Jr., "test sequence" and "test signal") supplied by the bit error rate tester, as the bit error rate

test signal is propagating from the input for the first optical transmitter to the output of the optical receiver *N*.

**Regarding claim 13**, Waschka, Jr. and Maione do not expressly disclose:

The method of claim 1, further comprising:

indicating that a bit error rate for each of the *N* optical communication channels is less than a specified bit error rate value when the measured bit error rate is less than or equal to the predetermined system bit error rate threshold.

However, Waschka, Jr. and Maione do disclose providing a BER indication for each of the channels when the measured system BER is unacceptable (Waschka, Jr., col. 19, lines 30-42). In the case that the measured system BER is acceptable (the measured bit error rate is less than or equal to the predetermined system bit error threshold), it would be obvious to a person of ordinary skill in the art to set the BER of each of the communication channels to be less than a specified BER, that is, the predetermined system bit error rate threshold. One of ordinary skill in the art would have been motivated to do this in order to keep the system BER less than the predetermined system bit error rate threshold. More exactly, the system BER is the cumulative sum of the channel BER values. Thus, if the BER of each communication channel is less than the predetermined system bit error rate threshold, the system BER would be less than that same threshold. Accordingly, at the time the invention was made, it would have been obvious to a person of ordinary skill in the art to also include said indicating. One of ordinary skill in the art would have been motivated to do this to show the status of the communication channels, informing maintenance personnel of the BER status of the communication channels (Waschka, Jr., col. 5, lines 22-27).

**Regarding claim 14**, Waschka, Jr. and Maione disclose:

The method of claim 1, wherein the monitoring of the bit error rate is performed at an input (Waschka, Jr., note sequence detectors 57 and 61 in Figs. 4 and 7, col. 9, lines 42-50, col. 17, lines 14-38) of each of the *N* optical transmitters and *N* optical receivers.

**Regarding claim 20**, Waschka, Jr. and Maione disclose:

The method of claim 1, wherein the optical transmitters and receivers for the *N* optical communication channels are co-located (Waschka, Jr., Figs. 2-4, optical transceivers; Maione, transmitter and receiver sections in Fig. 1).

7. **Claims 3-11, 15-19, and 21-22** are rejected under 35 U.S.C. 103(a) as being unpatentable over Waschka, Jr. and Maione as applied to claim 1 above, and further in view of Bullock et al. (U.S. Patent No. 5,764,651).

**Regarding claim 3**, Waschka, Jr. and Maione do not expressly disclose:

The method of claim 1, wherein said monitoring said signal quality includes a bit parity check.

Bullock et al. teaches a method of testing a bit error rate for optical communication systems that includes a bit parity check (Bullock et al., col. 1, l. 57-67). This method is a part of a common and extremely well known communications network standard, SONET (Bullock et al., col. 1, l. 57). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate SONET in the method of Waschka, Jr. and Maione. One of ordinary skill in the art would have been motivated to do this for a variety of advantages. Bullock et al. states that an ideal telecommunications network environment would allow voice and data to be mixed, would support bandwidth-on-demand for data-intense applications, would provide network robustness and resiliency, and would offer flexible and fast service. One such network standard that tends to address these demands is the synchronous optical network (SONET) (col. 1, l. 11-18). SONET is also useful in its ability to interface with traditional, existing networks (Bullock et al., col. 1, l. 46-47), such as the network of Waschka, Jr. and

Maione. Another beneficial feature of SONET is an extensive error monitoring and correction capacity (Bullock et al., col. 1, l. 57 – col. 2, l. 10).

**Regarding claim 4**, Waschka, Jr. and Maione in view of Bullock et al. disclose:

The method of claim 1, wherein said monitoring includes monitoring a bit interleave parity (Bullock et al., col. 1, l. 57-67) for said bit parity check on each electrical signal in the *N* optical transmitter/receiver pairs.

**Regarding claim 5**, claim 5 is a method claim that corresponds largely to the method claim 3. Therefore, the recited steps in method claim 3 read on the corresponding steps in method claim 5. Claim 5 also includes limitations absent from claim 3. Waschka, Jr. and Maione in view of Bullock et al. also disclose these limitations:

co-located optical transmitter/receiver pairs (Waschka, Jr., Figs. 2-4, optical transceivers; Maione, transmitter and receiver sections in Fig. 1); and

identifying at least one faulty communication channel from said plurality of optical communication channels (Waschka, Jr., col. 5, lines 45-49) by performing a bit parity check (Bullock et al., col. 1, l. 57-67) for each transmitter/receiver pair (Waschka, Jr., note that the test signal is input into each transmitter and each receiver of a transmitter/receiver pair, col. 5, lines 28-49, col. 19, lines 13-42) because the measured bit error rate (Waschka, Jr., col. 31, lines 3-4) is greater than a predetermined system bit error rate threshold (Waschka, Jr., col. 31, line 4).

**Regarding claim 6**, Waschka, Jr. and Maione in view of Bullock et al. disclose:

The method of claim 5, further comprising monitoring (Waschka, Jr., col. 19, lines 30-59, col. 31, lines 5-21) a signal quality for the at least one faulty communication channel using an internal performance monitor (Waschka, Jr., BER test circuitry in each station, col. 19, lines 30-33).

**Regarding claim 7**, Waschka, Jr. and Maione in view of Bullock et al. disclose:

The method of claim 6, wherein said internal performance monitor checks a signal transmitted through the at least one faulty communication channel (Waschka, Jr., col. 19, lines 25-42).

**Regarding claim 8,** Waschka, Jr. and Maione in view of Bullock et al. disclose:

The method of claim 5, further comprising passing said bit error rate test signal through said plurality of optical communication channels (Waschka, Jr., channel links between stations, col. 19, lines 18-30).

**Regarding claim 9,** claim 9 is a system claim that corresponds largely to the method claim 3. Therefore, the recited steps in method claim 3 read on the corresponding means in system claim 9. Claim 9 also includes limitations absent from claim 3. Waschka, Jr. and Maione in view of Bullock et al. also disclose these limitations:

co-located transmitter/receiver pairs (Waschka, Jr., Figs. 2-4, transceivers; Maione, transmitter and receiver sections in Fig. 1); and

a diagnostic analyzer (Waschka, Jr., alarm units in Figs. 10-11) to analyze diagnostic output signals (Waschka, Jr., col. 5, lines 31-49) from said transmitters and said receivers and to identify (Waschka, Jr., col. 5, lines 40-42, col. 31, lines 19-21) at least one faulty communication channel from said optical transmitter/receiver pairs using a bit parity check (Bullock et al., col. 1, l. 57-67) because said measured bit error rate (Waschka, Jr., col. 31, lines 3-4) is greater than said predetermined bit error rate threshold (Waschka, Jr., col. 31, line 4).

**Regarding claim 10,** Waschka, Jr. and Maione in view of Bullock et al. disclose:

The system of claim 9, further comprising an internal performance monitor (Waschka, Jr., BER test circuitry in each station, col. 19, lines 30-33) coupled to said diagnostic analyzer.

**Regarding claim 11,** Waschka, Jr. and Maione in view of Bullock et al. disclose:

The system of claim 10, wherein said internal performance monitor includes an error monitoring unit (Waschka, Jr., Fig. 7, col. 15, line 64 – col. 16, line 4).

**Regarding claim 15**, Waschka, Jr. and Maione in view of Bullock et al. disclose:

The method of claim 5, wherein the plurality of optical communication channels include three or more optical communication channels that are cascaded (note each link between each pair of stations in Fig. 1).

**Regarding claim 16**, Waschka, Jr. and Maione in view of Bullock et al. disclose:

The method of claim 5, wherein the identifying at least one faulty communication channel monitors (Waschka, Jr., col. 19, lines 30-59, col. 30, lines 61-68, col. 31, lines 5-21) the signal quality of the bit error rate signal (Waschka, Jr., col. 9, line 63 – col. 10, line 3, col. 30, lines 61-68, col. 31, lines 3-21), as the bit error rate test signal is propagating from the input for the first optical transmitter through the continuous cascade of transmitter/receiver pairs.

**Regarding claim 17**, Waschka, Jr. and Maione in view of Bullock et al. disclose:

The method of claim 9, wherein the plurality of optical communication channels include three or more optical communication channels that are cascaded (note each link between each pair of stations in Fig. 1).

**Regarding claim 18**, Waschka, Jr. and Maione in view of Bullock et al. disclose:

The method of claim 9, wherein the diagnostic analyzer is configured to analyze the diagnostic output signals (Waschka, Jr., col. 5, lines 31-49) from said transmitters and receivers in response to monitoring (Waschka, Jr., col. 19, lines 30-59, col. 30, lines 61-68, col. 31, lines 3-21) a signal quality of the bit error rate signal (Waschka, Jr., col. 9, line 63 – col. 10, line 3, col. 30, lines 61-68, col. 31, lines 3-21) input to each of said transmitters and said receivers (Waschka, Jr., note that the test signal is input into each transmitter and each receiver of a transmitter/receiver pair, col. 5, lines 28-49, col. 19, lines 13-42).

**Regarding claim 19**, Waschka, Jr. and Maione in view of Bullock et al. disclose:

The method of claim 18, wherein each of said transmitters and said receivers (Waschka, Jr., note sequence detectors 57 and 61 in Figs. 4 and 7, col. 9, lines 42-50, col. 17, lines 14-38;

note that the test signal is input into each transmitter and each receiver of a transmitter/receiver pair, col. 5, lines 28-49, col. 19, lines 13-42) is configured to monitor the signal quality of the bit error rate signal supplied by the bit error rate tester, as the bit error rate test signal is propagating from the input of the first optical transmitter to the final optical receiver.

**Regarding claim 21**, Waschka, Jr. and Maione in view of Bullock et al. disclose:

The method of claim 5, wherein the plurality of optical communication channels are arranged in the continuous cascaded by connecting electrical outputs of optical receivers to inputs of optical transmitters in the plurality of transmitter/receiver pairs (Waschka, Jr., col. 1, l. 20-30, col. 16, l. 14-26 refer to Maione, see o/e/o regeneration in Fig. 1).

**Regarding claim 22**, Waschka, Jr. and Maione in view of Bullock et al. disclose:

The method of claim 9, wherein the plurality of optical communication channels are arranged in the continuous cascaded by connecting electrical outputs of optical receivers to inputs of optical transmitters in the plurality of transmitter/receiver pairs (Waschka, Jr., col. 1, l. 20-30, col. 16, l. 14-26 refer to Maione, see o/e/o regeneration in Fig. 1).

**Sato et al. as primary reference:**

8. **Claims 1-2, 12-14, and 20** are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al. (U.S. Patent No. 6,229,631 B1) in view of Waschka, Jr.

**Regarding claim 1**, Sato et al. discloses:

A method (Sato et al., col. 2, lines 40-43) of testing a bit error rate for each of a plurality (*N*) of optical communication channels (Sato et al., optical links between each transmitter/receiver 110, repeater 120, other successive repeaters, and the terminal transmitter/receiver along the "UPWARD" direction of optical fiber 100a in Fig. 12), *N* being greater than 2, in a wavelength division multiplexed (Sato et al., col. 9, lines 16-18) optical communication system having *N* optical transmitters (Sato et al., E/O converter 113 in

transmitter/receiver 110, E/O converter 123b in repeater 120, and other E/O converters in successive repeaters in Fig. 12) communicating to *N* optical receivers (Sato et al., O/E converter 124a in repeater 120, other O/E converters in successive repeaters, and the O/E converter in the terminal transmitter/receiver in Fig. 12) via *N* communication channels, the method comprising:

cascading (Sato et al., note cascaded configuration of the system in Fig. 12) said *N* optical communication channels such that an electrical output (output from O/E converters 124a in repeater 120 and in successive repeaters and in the terminal transmitter/receiver in Fig. 12) of an optical receiver *i* for an optical communication channel *i* is connected to an input of an optical transmitter *i+1* for an optical communication channel *i+1*, for all values of *i* from one to *N-1*, so as to form a continuous cascade of optical transmitter/receiver pairs;

supplying (Sato et al., estimation parameters in col. 6, line 19 – col. 8, line 20; col. 9, line 66 – col. 10, line 43) a bit error rate test signal (Sato et al., optical signal pattern in Figs. 3-4, col. 7, lines 43-50, col. 8, lines 3-6) from a bit error rate tester (Sato et al., workstation 130 in Fig. 12) to an input for a first optical transmitter for a first optical communication channel;

supplying (Sato et al., col. 10, lines 2-6) the bit error rate test signal from an output of optical receiver *N* to the bit error rate tester; and

detecting (Sato et al., col. 8, lines 15-20) errors in the bit error rate test signal received by the bit error rate tester and calculating therefrom a measured system bit error rate;

Sato et al. does not expressly disclose:

comparing the system measured bit error rate with a predetermined system bit error rate threshold; and

monitoring a signal quality for the bit error rate test signal at each of the *N* optical transmitters and each of the *N* optical receivers when the measured system bit error rate is

greater than the predetermined system bit error rate threshold to thereby determine which of the *N* optical communication channels has an associated bit error rate value that is greater/less than a specified bit error rate value.

However, Sato et al. does disclose a range of a system margin (Sato et al., col. 2, lines 41-52) related to the bit error rate (Sato et al., col. 6, lines 60-64) and adjusting the system to maintain an optimum operating condition (Sato et al., col. 10, lines 37-43). In determining the bounds of that margin, it is obvious that one bound would be a predetermined system BER threshold. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to compare the measured system BER with the predetermined system BER threshold. One of ordinary skill in the art would have been motivated to do this in order to know if the system of Sato et al. is operating within the range of its system margin. If the result of this comparison indicates that the system is operating outside of this range, recovery measures could be taken to ensure that the system is operating within the range (Sato et al., col. 1, lines 42-46).

Additionally, Waschka, Jr. teaches a method of testing a bit error rate in a similar optical communication system that comprises a monitoring (Waschka, Jr., col. 19, lines 30-59, col. 31, lines 5-21) of a signal quality for a bit error rate test signal. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate the general concept of this monitoring in the method of Sato et al. One of ordinary skill in the art would have been motivated to do this to determine the location of faults along the transmission line (Waschka, Jr., col. 19, lines 38-54; Sato et al., col. 1, lines 33-41).

**Regarding claim 2**, Sato et al. in view of Waschka, Jr. discloses:

The method of claim 1 (see treatment of claim 1 under Sato et al. in view of Waschka, Jr.), wherein said predetermined system bit error rate is equal to the specified bit error rate for

each of N optical communication channels (see treatment of claim 1 under Sato et al. in view of Waschka, Jr.).

**Regarding claim 12**, Sato et al. in view of Waschka, Jr. discloses:

The method of claim 1, wherein said monitoring monitors a received signal quality (Waschka, Jr., col. 19, lines 30-59, col. 31, lines 5-21) for the bit error rate test signal (Waschka, Jr., "test sequence" and "test signal") supplied by the bit error rate tester, as the bit error rate test signal is propagating from the input for the first optical transmitter to the output of the optical receiver *N*.

**Regarding claim 13**, Sato et al. in view of Waschka, Jr. does not expressly disclose:

The method of claim 1, further comprising:

indicating that a bit error rate for each of the *N* optical communication channels is less than a specified bit error rate value when the measured bit error rate is less than or equal to the predetermined system bit error rate threshold.

However, Waschka, Jr. discloses providing a BER indication for each of the channels when the measured system BER is unacceptable (Waschka, Jr., col. 19, lines 30-42). In the case that the measured system BER is acceptable (the measured bit error rate is less than or equal to the predetermined system bit error threshold), it would be obvious to a person of ordinary skill in the art to set the BER of each of the communication channels to be less than a specified BER, that is, the predetermined system bit error rate threshold. One of ordinary skill in the art would have been motivated to do this in order to keep the system BER less than the predetermined system bit error rate threshold. More exactly, the system BER is the cumulative sum of the channel BER values. Thus, if the BER of each communication channel is less than the predetermined system bit error rate threshold, the system BER would be less than that same threshold. Accordingly, at the time the invention was made, it would have been obvious to a person of ordinary skill in the art to also include said indicating. One of ordinary skill in the art

would have been motivated to do this to show the status of the communication channels, informing maintenance personnel of the BER status of the communication channels (Waschka, Jr., col. 5, lines 22-27).

**Regarding claim 14**, Sato et al. in view of Waschka, Jr. does not expressly disclose:

The method of claim 1, wherein the monitoring of the bit error rate is performed at an input of each of the *N* optical transmitters and *N* optical receivers.

Although Waschka, Jr. teaches performing said monitoring at an input of each of its own optical transmitters and each of its own optical receivers, the structural details of Waschka, Jr. and Sato et al. do differ. It is debatable whether or not it would be technically obvious to perform said monitoring at an input of each of the optical transmitters of Sato et al. *in the same way* that Waschka, Jr. does. That is, while it is obvious to implement said monitoring of Waschka, Jr. in the system of Sato et al., it is not clear that it would be obvious to implement said monitoring of Waschka, Jr. in the system of Sato et al. *with the same exact structural details* of Waschka, Jr. Nonetheless, Sato et al. teaches the general monitoring of each device in its system (Sato et al., col. 2, lines 40-46). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to perform the monitoring of a signal quality for a bit error rate test signal of Waschka, Jr. at any device and location in the system of Sato et al., including at the input of each of the optical transmitters of Sato et al. One of ordinary skill in the art would have been motivated to do this to more exactly isolate the location of any sources of degradations in the signal quality of the bit error rate test signal. In the instant case of monitoring an input of each of the optical transmitters of Sato et al., one of ordinary skill in the art would have been further motivated to do this to monitor the internal repeater equipment (including inputs to each of the optical transmitters) of Sato et al. for excessive BER (Waschka, Jr. col. 4, line 64 – col. 5, line 5).

**Regarding claim 20**, Sato et al. in view of Waschka, Jr. discloses:

The method of claim 1, wherein the optical transmitters and receivers for the *N* optical communication channels are co-located (Sato et al., e.g., O/E converter 124a and E/O converter 123b in repeater 120, and other pairs of O/E converters and E/O converters in successive repeaters in Fig. 12).

9. **Claims 3-11, 15-19, and 21-22** are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al. in view of Waschka, Jr. as applied to claim 1 above, and further in view of Bullock et al.

**Regarding claim 3**, Sato et al. in view of Waschka, Jr. does not expressly disclose:

The method of claim 1, wherein said monitoring said signal quality includes a bit parity check.

Bullock et al. teaches a method of testing a bit error rate for optical communication systems that includes a bit parity check (Bullock et al., col. 1, l. 57-67). This method is a part of a common and extremely well known communications network standard, SONET (Bullock et al., col. 1, l. 57). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate SONET in the method of Sato et al. in view of Waschka, Jr. One of ordinary skill in the art would have been motivated to do this for a variety of advantages. Bullock et al. states that an ideal telecommunications network environment would allow voice and data to be mixed, would support bandwidth-on-demand for data-intense applications, would provide network robustness and resiliency, and would offer flexible and fast service. One such network standard that tends to address these demands is the synchronous optical network (SONET) (col. 1, l. 11-18). SONET is also useful in its ability to interface with traditional, existing networks (Bullock et al., col. 1, l. 46-47), such as the network of Sato et al. in view of Waschka, Jr. Another beneficial feature of SONET is an extensive error monitoring and correction capacity (Bullock et al., col. 1, l. 57 – col. 2, l. 10).

**Regarding claim 4**, Sato et al. in view of Waschka, Jr., further in view of Bullock et al., discloses:

The method of claim 1, wherein said monitoring includes monitoring a bit interleave parity (Bullock et al., col. 1, l. 57-67) for said bit parity check on each electrical signal in the *N* optical transmitter/receiver pairs.

**Regarding claim 5**, claim 5 is a method claim that corresponds largely to the method claim 3. Therefore, the recited steps in method claim 3 read on the corresponding steps in method claim 5. Claim 5 also includes a limitation absent from claim 3. Sato et al. in view of Waschka, Jr., further in view of Bullock et al., also discloses this limitation:

identifying at least one faulty communication channel from said plurality of optical communication channels (Waschka, Jr., col. 5, lines 45-49) by performing a bit parity check (Bullock et al., col. 1, l. 57-67) for each transmitter/receiver pair (Waschka, Jr., note that the test signal is input into each transmitter and each receiver of a transmitter/receiver pair, col. 5, lines 28-49, col. 19, lines 13-42) because the measured bit error rate (Waschka, Jr., col. 31, lines 3-4) is greater than a predetermined system bit error rate threshold (Waschka, Jr., col. 31, line 4).

**Regarding claim 6**, Sato et al. in view of Waschka, Jr., further in view of Bullock et al., discloses:

The method of claim 5, further comprising monitoring (Waschka, Jr., col. 19, lines 30-59, col. 31, lines 5-21) a signal quality for the at least one faulty communication channel using an internal performance monitor (Sato et al., controllers 116 and 126 in each transmitter/receiver and repeater in Fig. 12 incorporating the monitoring concept of Waschka, Jr., BER test circuitry in each station, col. 19, lines 30-33).

**Regarding claim 7**, Sato et al. in view of Waschka, Jr., further in view of Bullock et al., discloses:

The method of claim 6, wherein said internal performance monitor checks a signal transmitted through the at least one faulty communication channel (Sato et al., controllers 116 and 126 in each transmitter/receiver and repeater in Fig. 12 incorporating the monitoring concept of Waschka, Jr., col. 19, lines 25-42).

**Regarding claim 8,** Sato et al. in view of Waschka, Jr., further in view of Bullock et al., discloses:

The method of claim 5, further comprising passing said bit error rate test signal through said plurality of optical communication channels (Sato et al., optical links between each transmitter/receiver 110, repeater 120, other successive repeaters, and the terminal transmitter/receiver along the "UPWARD" direction of optical fiber 100a in Fig. 12 incorporating the concept of Waschka, Jr., channel links between stations, col. 19, lines 18-30).

**Regarding claim 9**, claim 9 is a system claim that corresponds largely to the method claim 3. Therefore, the recited steps in method claim 3 read on the corresponding means in system claim 9. Claim 9 also includes a limitation absent from claim 3. Sato et al. in view of Waschka, Jr., further in view of Bullock et al., also discloses this limitation:

a diagnostic analyzer (Sato et al., workstation 130 in Fig. 12, col. 10, lines 2-6 incorporating the concept of Waschka, Jr., alarm units in Figs. 10-11) to analyze diagnostic output signals (Waschka, Jr., col. 5, lines 31-40) from said transmitters and said receivers and to identify (Waschka, Jr., col. 5, lines 40-42, col. 31, lines 19-21) at least one faulty communication channel from said optical transmitter/receiver pairs using a bit parity check (Bullock et al., col. 1, l. 57-67) because said measured bit error rate (Waschka, Jr., col. 31, lines 3-4) is greater than said predetermined bit error rate threshold (Waschka, Jr., col. 31, line 4).

**Regarding claim 10,** Sato et al. in view of Waschka, Jr., further in view of Bullock et al., discloses:

The system of claim 8, further comprising an internal performance monitor (Sato et al., controllers 116 and 126 in each transmitter/receiver and repeater in Fig. 12 incorporating the monitoring concept of Waschka, Jr., BER test circuitry in each station, col. 19, lines 30-33) coupled to said diagnostic analyzer.

**Regarding claim 11**, Sato et al. in view of Waschka, Jr., further in view of Bullock et al., discloses:

The system of claim 9, wherein said internal performance monitor includes an error monitoring unit (Sato et al., controllers 116 and 126 in each transmitter/receiver and repeater in Fig. 12 incorporating the monitoring concept of Waschka, Jr., Fig. 7, col. 15, line 64 – col. 16, line 4).

**Regarding claim 15**, Sato et al. in view of Waschka, Jr., further in view of Bullock et al., discloses:

The method of claim 5, wherein the plurality of optical communication channels include three or more optical communication channels that are cascaded (note each optical link between each transmitter/receiver 110, repeater 120, other successive repeaters, and the terminal transmitter/receiver along the "UPWARD" direction of optical fiber 100a in Fig. 12).

**Regarding claim 16**, Sato et al. in view of Waschka, Jr., further in view of Bullock et al., discloses:

The method of claim 5, wherein the identifying at least one faulty communication channel monitors (Waschka, Jr., col. 19, lines 30-59, col. 30, lines 61-68, col. 31, lines 5-21) the signal quality of the bit error rate signal (Waschka, Jr., col. 9, line 63 – col. 10, line 3, col. 30, lines 61-68, col. 31, lines 3-21), as the bit error rate test signal is propagating from the input for the first optical transmitter through the continuous cascade of transmitter/receiver pairs.

**Regarding claim 17**, Sato et al. in view of Waschka, Jr., further in view of Bullock et al., discloses:

The method of claim 9, wherein the plurality of optical communication channels include three or more optical communication channels that are cascaded (note each optical link between each transmitter/receiver 110, repeater 120, other successive repeaters, and the terminal transmitter/receiver along the "UPWARD" direction of optical fiber 100a in Fig. 12).

**Regarding claim 18**, Sato et al. in view of Waschka, Jr., further in view of Bullock et al., discloses:

The method of claim 9, wherein the diagnostic analyzer is configured to analyze the diagnostic output signals (Waschka, Jr., col. 5, lines 31-49) from said transmitters and receiver in response to monitoring (Waschka, Jr., col. 19, lines 30-59, col. 30, lines 61-68, col. 31, lines 3-21) a signal quality of the bit error rate signal (Waschka, Jr., col. 9, line 63 – col. 10, line 3, col. 30, lines 61-68, col. 31, lines 3-21) input to each of said transmitters and said receivers (Waschka, Jr., note that the test signal is input into each transmitter and each receiver of a transmitter/receiver pair, col. 5, lines 28-49, col. 19, lines 13-42).

**Regarding claim 19**, Sato et al. in view of Waschka, Jr., further in view of Bullock et al., discloses:

The method of claim 18, wherein each of said transmitters and said receivers (Waschka, Jr., note sequence detectors 57 and 61 in Figs. 4 and 7, col. 9, lines 42-50, col. 17, lines 14-38; note that the test signal is input into each transmitter and each receiver of a transmitter/receiver pair, col. 5, lines 28-49, col. 19, lines 13-42) is configured to monitor the signal quality of the bit error rate signal supplied by the bit error rate tester, as the bit error rate test signal is propagating from the input of the first optical transmitter to the final optical receiver.

**Regarding claim 21**, Sato et al. in view of Waschka, Jr., further in view of Bullock et al., discloses:

The method of claim 5, wherein the plurality of optical communication channels are arranged in the continuous cascaded by connecting electrical outputs of optical receivers to

inputs of optical transmitters in the plurality of transmitter/receiver pairs (Sato et al., e.g., O/E converter 124a and E/O converter 123b in repeater 120, and other pairs of O/E converters and E/O converters in successive repeaters in Fig. 12).

**Regarding claim 22**, Sato et al. in view of Waschka, Jr., further in view of Bullock et al., discloses:

The method of claim 9, wherein the plurality of optical communication channels are arranged in the continuous cascaded by connecting electrical outputs of optical receivers to inputs of optical transmitters in the plurality of transmitter/receiver pairs (Sato et al., e.g., O/E converter 124a and E/O converter 123b in repeater 120, and other pairs of O/E converters and E/O converters in successive repeaters in Fig. 12).

***Response to Arguments***

10. Applicant's arguments, filed on 01 September 2004, with respect to the claims rejected under Waschka, Jr., have been fully considered but they are not persuasive. Applicant presents two points.

**Regarding the first point**, Applicant states,

> "The repeater stations in Fig. 1 of Waschka only use **optical** links to transmit the BER test sequence. Although Waschka discloses orderwire links for each station, these links are used for supervisory message -- not for BER test sequences. *See, e.g.*, col. 4, lines 23-26 and col. 19, lines 25-29. Since none of the repeater stations in Fig. 1 of Waschka can be interpreted as a receiver for a cascaded optical channel, none of the links 17a terminating at a repeater station can be interpreted as a cascaded optical channel" (filed on 01 September 2004, p. 14, 1st full paragraph, emphasis Applicant's).

Examiner respectfully directs attention to Waschka, Jr., col. 1, l. 20-30 and col. 16, l. 14-26. Both portions refer to Maione, which teaches optical-to-electrical-to-optical regeneration in Fig. 1. Additionally, in Waschka, Jr., col. 16, l. 14-26 expressly discusses BER testing that involves "an optical detector," "photodetection circuitry," "photoelectric outputs," and "photodetector circuits." Such teachings in Waschka, Jr. and Maione can lead one to interpret the repeater

stations in Fig. 1 of Waschka, Jr. as receivers for cascaded optical channels. Accordingly, Examiner finds it difficult to consider Applicant's first point to be persuasive.

**Regarding the second point**, Applicant states,

> "As amended, independent claims 5 and 9 each recite a 'plurality of optical communication channels arranged in a continuous cascade of a plurality of **co-located** optical transmitter/receiver pairs.'...
>
> [T]he present invention includes an exemplary embodiment in which each of the optical transmitters $TX_N$ and receivers $RX_N$ for the cascaded optical channels are located in optical network elements 110 and 112, at the same testing site. As shown in Fig. 2, a diagnostic analyzer may also be located at this site. Thus, bit error rate (BER) testing is performed on the optical transmitters and receivers of a wavelength division multiplexed (WDM) optical communication system before deployment...
>
> Instead, Waschka discloses **post-deployment** testing of terminal stations in an optical network" (filed on 01 September 2004, p. 17, middle paragraph – p. 18, 1st paragraph, emphasis Applicant's).

Examiner respectfully notes that Applicant's intended usage of the term "co-located" may be narrower in scope than the scope of the actual claim language. Note that each station in Fig. 1 of Waschka, Jr. has an optical transmitter and an optical receiver (e.g., as in Fig. 1 of Maione or col. 5, l. 28-49 of Waschka, Jr.), a "transmitter/receiver pair." Each station constitutes a location so that an optical transmitter and an optical receiver, together, located therein constitute a "co-located optical transmitter/receiver pair." Accordingly, Examiner finds it difficult to consider Applicant's second point to be persuasive.

Additionally, Applicant's discussion of "same testing site" and "before deployment" and "post-deployment" may indicate a particular view of "co-located" optical transmitter/receiver pairs and optical transmitter and optical receivers. If Applicant considers such a view to patentably distinguish Applicant's invention from the prior art of record, then Examiner encourages adjustment to the claim language to more exactly capture this view.

**Summarily**, Applicant's arguments are not persuasive. Therefore, Examiner respectfully maintains the standing rejections.

11. Applicant's arguments, filed on 01 September 2004, with respect to the claims rejected under Sato et al., have been fully considered but they are not persuasive. Applicant presents two points.

**Regarding the first point**, Applicant states,

> "Examiner again fails to recognize that claim 1 requires that the **electrical output** of the receiver for each optical communication channel *i* be connected to the input of the transmitter for the next optical communication channel *i+1*. Sato discloses that the output links 100a, 100b of each receiver is an **optical fiber** (*see, e.g.,* col. 9, lines 12-18; col. 10, lines 15-19). None of these optical fibers 100a, 100b can be interpreted as an 'electrical output... connected to an input of an optical transmitter.' Thus, none of the repeaters 120 in Fig. 12 can be interpreted as a receiver for a cascaded optical communication channel" (filed on 01 September 2004, p. 15, last paragraph, emphasis Applicant's).

Examiner respectfully directs attention to Fig. 12 of Sato et al., teaches optical-to-electrical-to-optical conversion from O/E converter 124a to E/O converter 123b in repeater 120. Such teachings in Sato et al. can lead one to interpret the repeaters 120 in Fig. 12 as receivers for cascaded optical channels. Additionally, the standing rejections do not rely on optical fibers 100a, 100b as electrical outputs. Accordingly, Examiner finds it difficult to consider Applicant's first point to be persuasive.

**Regarding the second point**, Applicant states,

> "As amended, independent claims 5 and 9 each recite a 'plurality of optical communication channels arranged in a continuous cascade of a plurality of **co-located** optical transmitter/receiver pairs.'...
>
> [T]he present invention includes an exemplary embodiment in which each of the optical transmitters $TX_N$ and receivers $RX_N$ for the cascaded optical channels are located in optical network elements 110 and 112, at the same testing site. As shown in Fig. 2, a diagnostic analyzer may also be located at this site. Thus, bit error rate (BER) testing is performed on the optical transmitters and receivers of a wavelength division multiplexed (WDM) optical communication system before deployment...
>
> Instead, Waschka discloses **post-deployment** testing of terminal stations in an optical network...
>
> Similarly, the network in Fig. 12 of Sato also represents a deployed system..." (filed on 01 September 2004, p. 17, middle paragraph – p. 18, 1st paragraph, emphasis Applicant's).

Examiner respectfully notes that Applicant's intended usage of the term "co-located" may be narrower in scope than the scope of the actual claim language. Note that each repeater in Fig. 12 of Sato et al. has an optical transmitter and an optical receiver (e.g., E/O converter 123b and O/E converter 124a in repeater 120), a "transmitter/receiver pair." Each repeater constitutes a location so that an optical transmitter and an optical receiver, together, located therein constitute a "co-located optical transmitter/receiver pair." Accordingly, Examiner finds it difficult to consider Applicant's second point to be persuasive.

Additionally, Applicant's discussion of "same testing site" and "before deployment" and "post-deployment" may indicate a particular view of "co-located" optical transmitter/receiver pairs and optical transmitter and optical receivers. If Applicant considers such a view to patentably distinguish Applicant's invention from the prior art of record, then Examiner encourages adjustment to the claim language to more exactly capture this view.

**Summarily**, Applicant's arguments are not persuasive. Therefore, Examiner respectfully maintains the standing rejections.

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Kim whose telephone number is 571-272-3033. The examiner can normally be reached on Mon.-Fri. 9 AM to 5 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571-272-3022. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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